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FORSGREN Associates Inc.

Memo

To: Shaun Dustin, Mayor

From: Craig Rasmussen Craig L Rasmussen

CC: Lance Anderson, Cache Landmark

Date: February 19, 2015

Re: ITD Girder for Blacksmith Fork Bridge

We understand that Cannon Builders, the Contractor that submitted the lowest responsible bid for the Blacksmith Fork River Bridge at 2600 South, indicates there is a significant cost savings by switching the UDOT deck bulb tee for an equivalent ITD section.

Forsgren is familiar with the ITD section and its similarities/differences to the UDOT girder. The ITD girder is slightly wider than the UDOT girder and we understand that it would be cast with narrower flanges to match the UDOT girder width and to match the out-out dimension of the proposed bridge. The standard ITD girder is slightly heavier than the UDOT girder, however, design and pre-cast alterations may mitigate this factor and allow for almost identical girder weights, depending on the pre-castor flexibility to accommodate changes to flange depth and cross slope.

UDOT requires that to use the deck bulb tee girder the roadway have an average daily traffic count less than 30,000 vehicles; similarly ITD standards limit the use of the deck bulb tee girder to non-interstate roads with lower traffic volume to eliminate fatigue related concerns with the girder-girder connection. We have reviewed the girder-girder connection for the ITD girder configuration; and as with the UDOT girder design, the ITD girder incorporates a welded plate system with a grouted keyway between the girders. The UDOT connection is similar to the Washington DOT girder connection where the embedded angles in each girder flange are sloped with a diamond shaped grouted keyway. The ITD connection is similar to the Wyoming DOT girder connection which has horizontal embedded angles upon which a flat plate is welded. The grout keyway is more wedge shaped than diamond. Both are common precast connection configurations and have been rated Level 1 through the FHWA Pre-fabricated Bridge Evaluation System. Copies of submitted details and the resulting Detail Classification are attached.

Revising the bridge girder/deck system will require engineering of the ITD girders, adjusting the railing details, revising the girder diaphragms, coordinating with the contractor and the pre-cast provider to ensure that the design criteria are met, adjust specifications to the ITD standards for girder fabrication, and make any necessary revisions to the bridge sub-structure to accommodate the changed girder system.

The ITD girders meet AASHTO design criteria and, in our opinion, would be an acceptable alternate to the UDOT deck bulb tee girders.

2.2.9 Connection Detail Data Sheets for Adjacent Butted Beam Systems

The following pages contain data sheets for the various prefabricated butted beam systems. This information was primarily gathered from agencies that have developed and used the systems. Most data in the sheets were provided by the owner agency; the authors added text when an agency did not supply all requested information. The owner agencies also provide a comparative classification rating.

Each connection detail data sheet is presented in a two-page format. Users of this Manual can simply remove and copy a data sheet for use in developing a system for a particular project. These sheets are meant to give users a basic understanding of each connection that can be used during the type study phase of a project. The data sheets are not meant to be comprehensive, but do convey the component make-up of the detail, how it is meant to function, and provide some background on its field application. Users will need to investigate each connection further, consider site-specific conditions, and apply sound engineering judgment during design.

The key information provided for each connection is as follows:

- Name of the organization that supplied the detail
- Contact person at the organization
- Detail Classification Level
    - **Level 1**
      This is the highest classification level that is generally assigned to connections that have either been used on multiple projects or have become standard practice by at least one owner agency. It typically represents details that are practical to build and will perform adequately.
    - **Level 2**
      This classification is for details that have been used only once and were found to be practical to build and have performed adequately.
    - **Level 3**
      This classification is for details that are either experimental or conceptual. Details are included in this Manual that have been researched in laboratories, but to the knowledge of the authors, have not been put into practical use on a bridge. Also included in this classification are conceptual details that have not been studied in the laboratory, but are thought to be practical and useful.
- Components Connected
- Name of Project where the detail was used
- Manual Reference Section
    - The section(s) of this Manual applicable to the particular detail shown.
- Connection Details
- Description, comments, specifications and special design procedures
- Forces that the connection is designed to transmit
- Information on the use of the connection (including inspection ratings)
- A performance evaluation of the connection rated by the submitting agency

Connection Details for Prefabricated Bridge Elements **Federal Highway Administration**

Organization: Wyoming DOT
Contact Name: Gregg Fredrick
Address: 5300 Bishop Blvd
Cheyenne, Wyoming 82009

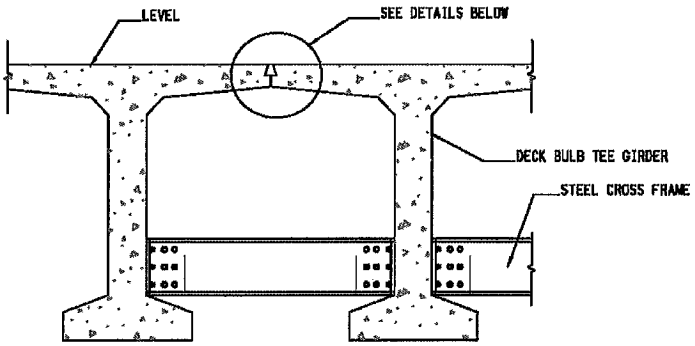
Detail Number: 2.2.1.1 B
Phone Number: 307.777.4427
E-mail: gregg.fredrick@dot.state.wy.us

Detail Classification: Level 1

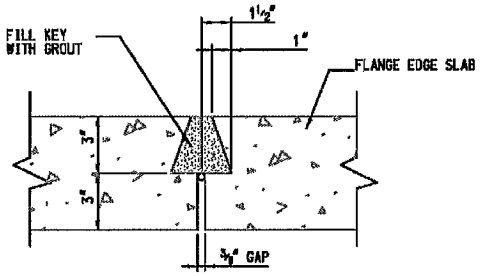
Components Connected: Longitudinal Beam/Slab to Adjacent Longitudinal Beam/Slab

Name of Project where the detail was used: Bridge over middle Fork Crazy Woman Creek (Wyoming Drawing Number 6635)

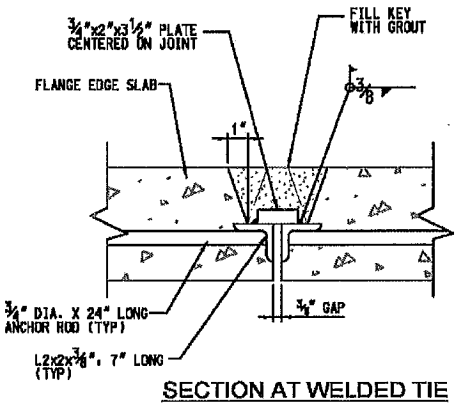
Connection Details: Manual Reference Section 2.2.1.1 See Reverse side for more information on this connection



TYPICAL DECK BULB TEE DETAILS



SECTION ALONG LONGITUDINAL JOINT



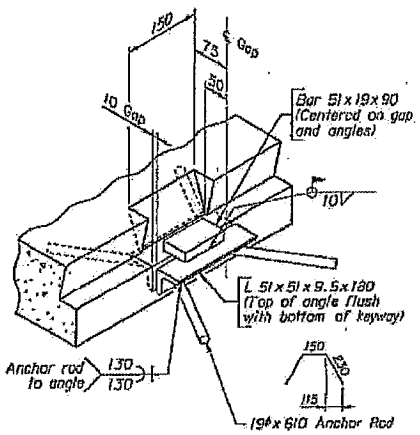
SECTION AT WELDED TIE

LONGITUDINAL JOINT DETAILS

Description, comments, specifications, and special design procedures

See Reverse side for more information on this connection

This is a typical connection used between deck bulbed T girders. The welded connection is spaced at approximately 6 foot intervals. Additional surfacing is not typically specified, as the top of the flange is the final wearing surface.



WELD TIE CONNECTION DETAIL
(Backer rod, non-shrink grout, and near girder flange not shown) (Weld tie assembly and flange blockout is symmetrical)

Editor's Notes

What forces are the connection designed to transmit? (place x in appropriate boxes)

Shear | Moment | Compression | Tension | Torsion

What year was this detail first used? | Condition at last inspection (if known)

How many times has this detail been used? | Year of last inspection

Would you use it again? yes (yes/no/maybe)

On a scale of 1 to 10, how would you rate the performance of this connection in the following categories?

Speed of Construction	10	(0 very slow, 10 very fast) When compared to conventional construction
Constructability	7	(0 difficulty making connection, 10 went together easily)
Cost	6	(0 expensive, 10 cost effective) When compared to other connection methods
Durability		(0 not durable, 10 very durable)
Inspection Access	0	(0 not visible, 10 easily inspected)
Future Maintenance	3	(0 will need maintenance, 10 no maintenance anticipated)

Connection Details for Prefabricated Bridge Elements **Federal Highway Administration**

Organization: Washington State D.O.T.
Contact Name: Bijan Khaleghi
Address: P O Box 47340 Olympia, WA 98504
Phone Number: 360-705-7395
E-mail: KhalegB@wsdot.wa.gov

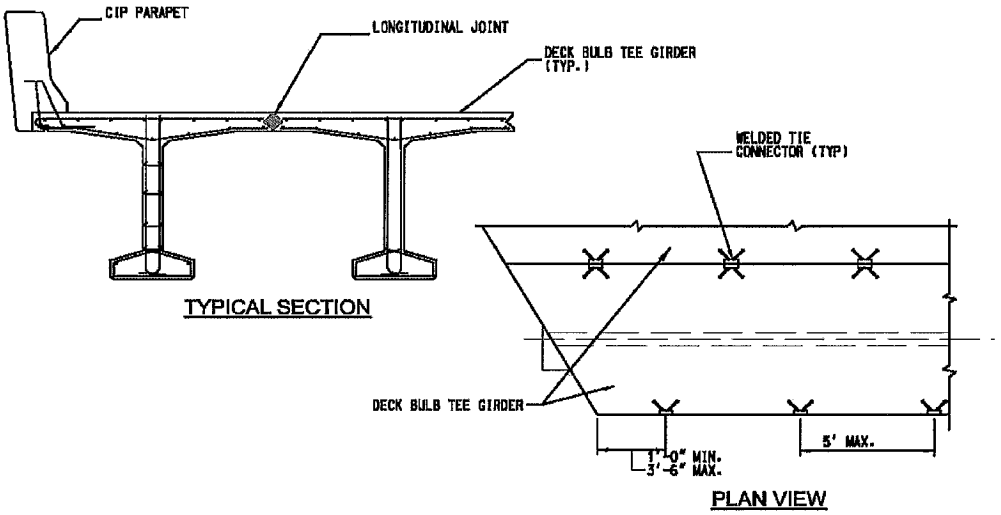
Detail Number: 2.2.1.1 A

Detail Classification: Level 1

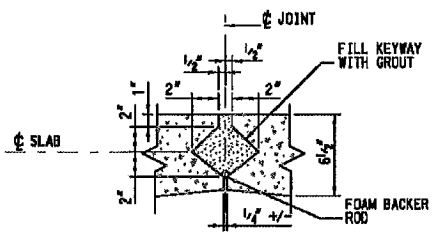
Components Connected: Precast Deck Beam to Precast Deck Beam

Name of Project where the detail was used: Standard Detail

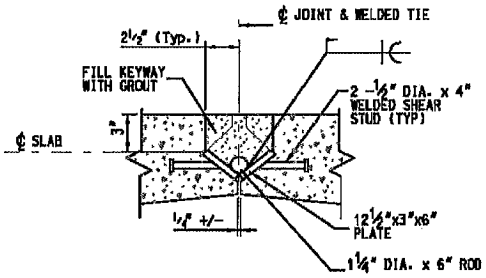
Connection Details: Manual Reference Section 2.2.1.1 See Reverse side for more information on this connection



TYPICAL DECK BULB TEE DETAILS



FLANGE SECTION
THROUGH LONGITUDINAL JOINT



FLANGE SECTION
AT WELDED TIE

Description, comments, specifications, and special design procedures See Reverse side for more information on this connection

These connections are used for a variety of girder types in Washington State. Girder types include:
- Double tee beams
- Triple Tee (Ribbed) Beams
- Deck Bulb Tees

The welded connections are spaced a maximum of 5 feet on center.

Editor's Notes

What forces are the connection designed to transmit? (place x in appropriate boxes)

Shear: x | Moment: | Compression: | Tension: | Torsion:

What year was this detail first used? 1998

Condition at last inspection (if known): Good

How many times has this detail been used? 5

Year of last inspection: 2005

Would you use it again? yes (yes/no/maybe)

On a scale of 1 to 10, how would you rate the performance of this connection in the following categories?

Speed of Construction	9	(0 very slow, 10 very fast) When compared to conventional construction
Constructability	9	(0 difficulty making connection, 10 went together easily)
Cost	9	(0 expensive, 10 cost effective) When compared to other connection methods
Durability	6	(0 not durable, 10 very durable)
Inspection Access	8	(0 not visible, 10 easily inspected)
Future Maintenance	7	(0 will need maintenance, 10 no maintenance anticipated)